TITLE: Method for manufacturing shallow trench isolation by high-density plasma chemical gas-phase deposition technique

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BASIC-ABSTRACT:

NOVELTY - A high-density plasma chemical vapor-phase deposition (HDPCVD) technique which uses O2 and SiH4 as reactants to deposit onto dielectric oxide layers.

DETAILED DESCRIPTION - Before applying the high-density plasma chemical vapor-phase deposition (HDPCVD) process, a low pressure chemical vapor-phase deposition (LPCVD) process is used to form a tetra-ethyl-ortho-silicate oxide layer (TEOS). Alternatively, a sub-atmospheric pressure chemical vapor-phase deposition (SACVD) process is used to form a ozone-tetra-ethyl-ortho-silicate oxide layer (O3-TEOS) covering on the surface of the trench as the bottom layer.

USE - Semi-conductor integrated circuit manufacture.

ADVANTAGE - Excellent trench fill-in of the HDPCVD process, avoids damage and pollution of the metal impurities on the sidewall of the trench. Improved manufacturing method of the shallow isolation region.

TI Method for manufacturing **shallow trench isolation** by high-density plasma chemical vapor deposition

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AB Recently, the manufg. process of **shallow trench isolation** (**STI**) region has been considered as important semiconductor manufg. technique. Conventionally, it utilizes the chem. vapor deposition (CVD) process to form a dielecs. to fill-in the trench in the substrate. However, as the d. of the integrated circuit is increasing continuously and the size of device is gradually decreased, the above-mentioned deposition technique could not fill up easily the trench, which causes the isolation effect of the device being influenced. In order to eliminate the above-mentioned problem, a high-d. plasma chem. vapor deposition (**HDPCVD**) technique is provided, which is mainly to use O2 and SiH4 as the reactant to deposit the dielecs. Meanwhile, Ar plasma is used to sputter and remove the overhang portion on the dielecs. layer of the upper-half portion of the trench sidewall, which could efficiently improve the effect of the dielecs. filling-in the trench. However, the Ar plasma sputtering in the **HDPCVD** process causes easily the damage and the pollution of the metal impurities on the sidewall of the trench, which brings new problem of the device performance. Therefore, this invention provides an improved manufg. method of the **STI** region. Before applying the **HDPCVD** process, a low pressure chem. vapor deposition (**LPCVD**) process is used to form a TEOS layer, or the sub-atm. pressure chem. vapor deposition (SACVD) process is used to form an O3-TEOS layer covering on the surface of the trench as the bottom layer. Thus, it does not only maintain the excellent trench fill-in result of the **HDPCVD** process but also further avoid the damage and the pollution of the metal impurities on the sidewall of the trench.